US008521382B2

(12) United States Patent
Kieliszewski

(10) Patent No.: US 8,521,382 B2
(45) Date of Patent: Aug. 27, 2013

(54) **TRANSMISSION OIL TEMPERATURE ESTIMATION SYSTEMS AND METHODS**

(75) Inventor: **Mark David Kieliszewski**, Lake Orion, MI (US)

(73) Assignee: **GM Global Technology Operations LLC**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 235 days.

(21) Appl. No.: **12/891,052**

(22) Filed: **Sep. 27, 2010**

(65) **Prior Publication Data**

US 2012/0053800 A1 Mar. 1, 2012

Related U.S. Application Data

(60) Provisional application No. 61/378,163, filed on Aug. 30, 2010.

(51) **Int. Cl.**
G06F 19/00 (2011.01)

(52) **U.S. Cl.**
USPC **701/60**; 701/51; 701/53; 701/54; 701/55; 701/58; 123/350; 123/478

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,975,628	A	*	12/1990	Lemieux	318/599
5,048,495	A	*	9/1991	Onari et al.	123/492
5,819,194	A	*	10/1998	Hara et al.	701/89
5,855,533	A	*	1/1999	Tolkacz et al.	477/110
6,231,478	B1	*	5/2001	Sakai	477/111
6,236,925	B1	*	5/2001	Gierling et al.	701/53
6,308,516	B1	*	10/2001	Kamada	60/450
6,352,146	B1	*	3/2002	Eismann et al.	192/3.58
6,504,474	B1	*	1/2003	Goodnight et al.	340/439
6,594,573	B1	*	7/2003	Rossmann et al.	701/67
6,611,781	B1	*	8/2003	Gutmann	702/148
6,877,486	B2	*	4/2005	Ellies et al.	123/478
7,077,783	B2	*	7/2006	Senger et al.	477/98
8,052,577	B2	*	11/2011	Tamba et al.	477/168
8,140,230	B2	*	3/2012	Haggerty et al.	701/54
2004/0204281	A1	*	10/2004	Wakayama	475/161
2005/0056260	A1	*	3/2005	Ellies et al.	123/478
2005/0278103	A1	*	12/2005	Higashimata et al.	701/67
2009/0054206	A1	*	2/2009	Tamba et al.	477/168
2009/0132135	A1	*	5/2009	Quinn et al.	701/55
2010/0087996	A1	*	4/2010	Haggerty et al.	701/58
2010/0102767	A1	*	4/2010	Endo et al.	318/453
2010/0262352	A1	*	10/2010	Kuwahara et al.	701/102
2010/0313849	A1	*	12/2010	Stoner et al.	123/350
2011/0084638	A1	*	4/2011	Patel et al.	318/400.32
2011/0153144	A1	*	6/2011	Dlugoss et al.	701/29

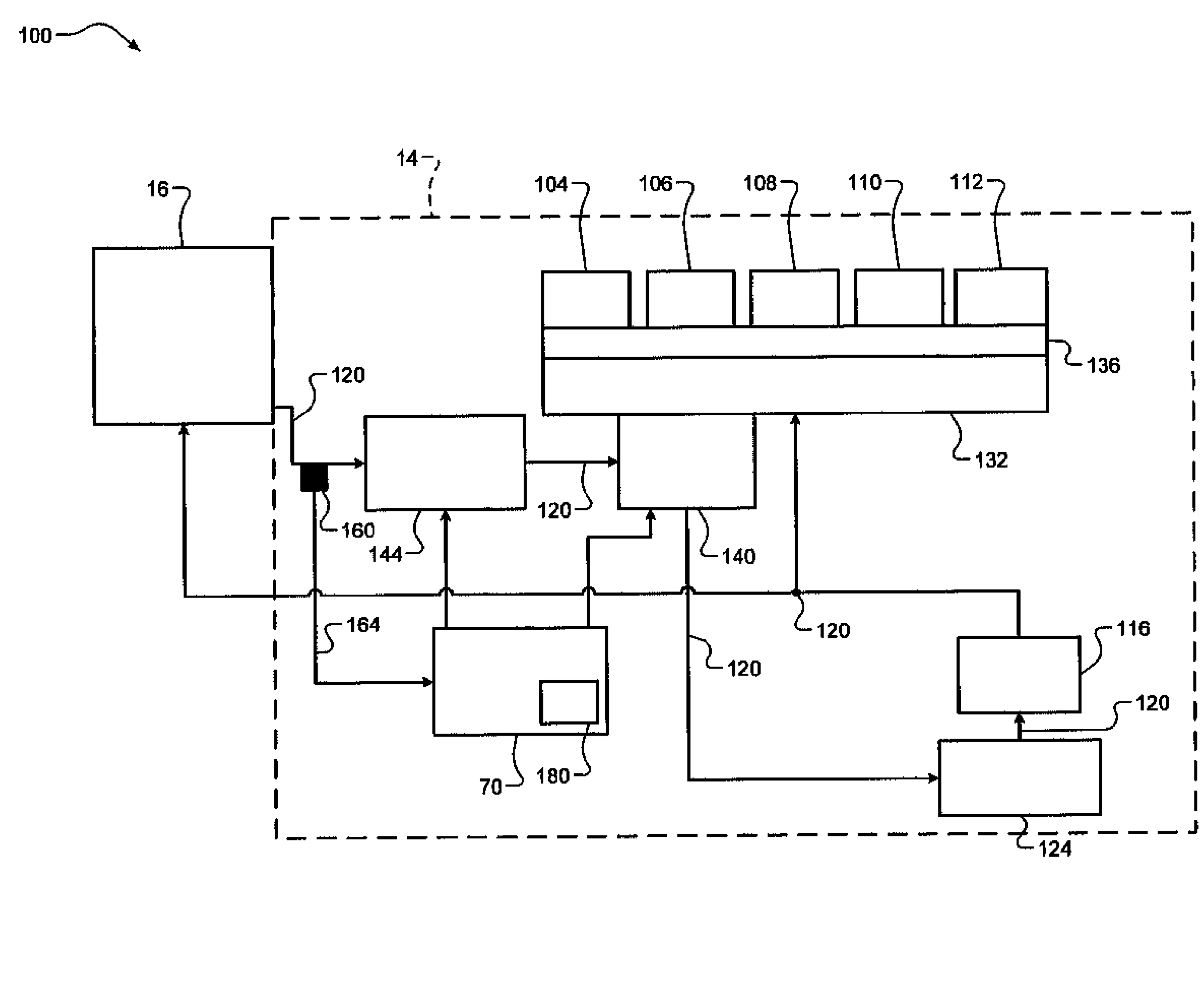
* cited by examiner

Primary Examiner — Khoi Tran
Assistant Examiner — Jonathan L Sample

(57) **ABSTRACT**

A system for a vehicle includes a filter module and a coefficient determination module. The filter module generates a valve body oil temperature signal as a function of a transmission oil temperature signal, the valve body oil temperature signal, and a filter coefficient. The coefficient determination module varies the filter coefficient based on the valve body oil temperature signal. The transmission oil temperature signal corresponds to a first temperature of transmission oil measured at a location between a torque converter and a variable bleed solenoid (VBS). The valve body oil temperature signal corresponds to a second temperature of transmission oil provided to a clutch of a transmission from a valve body.

16 Claims, 4 Drawing Sheets



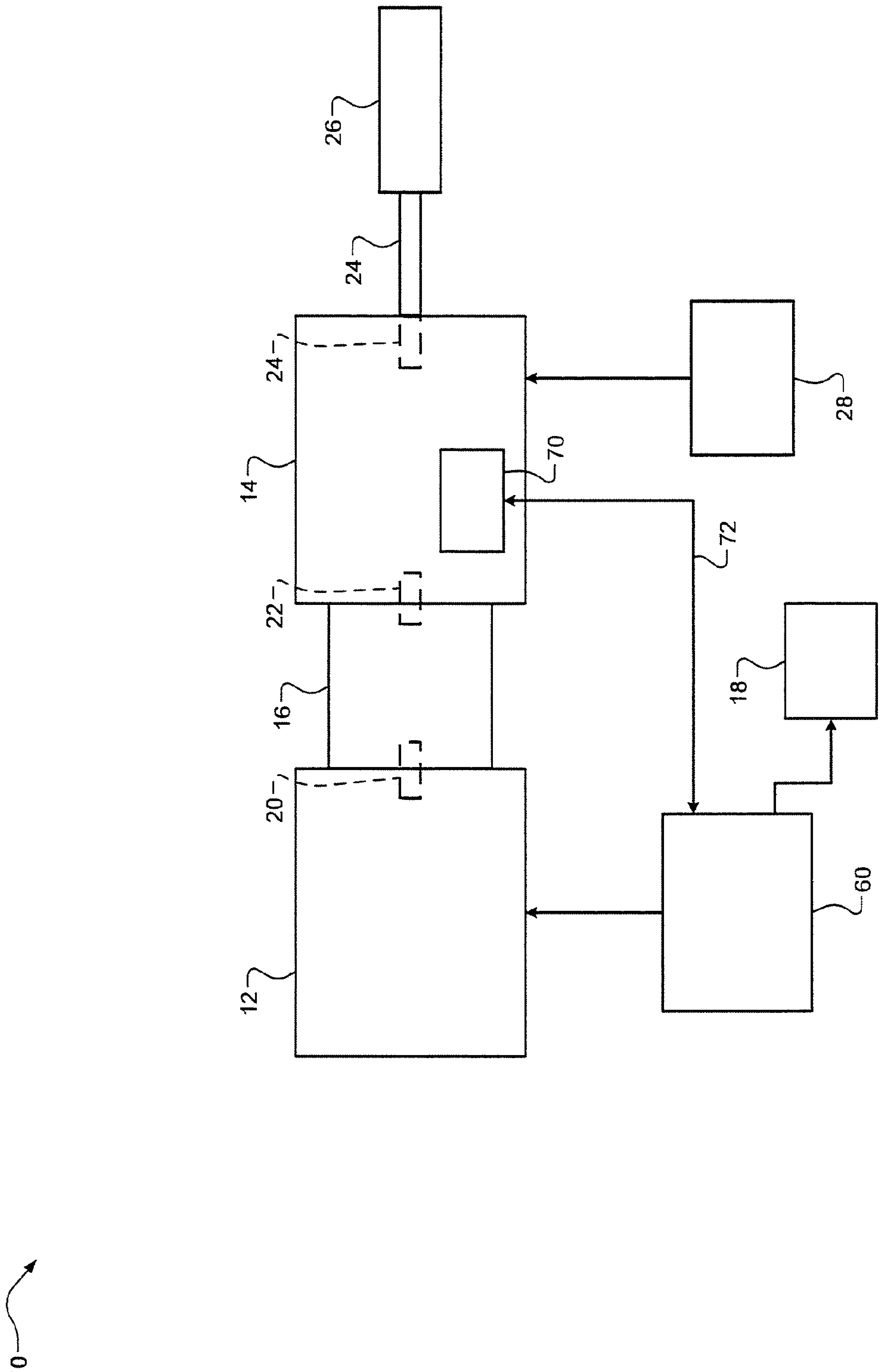


FIG. 1

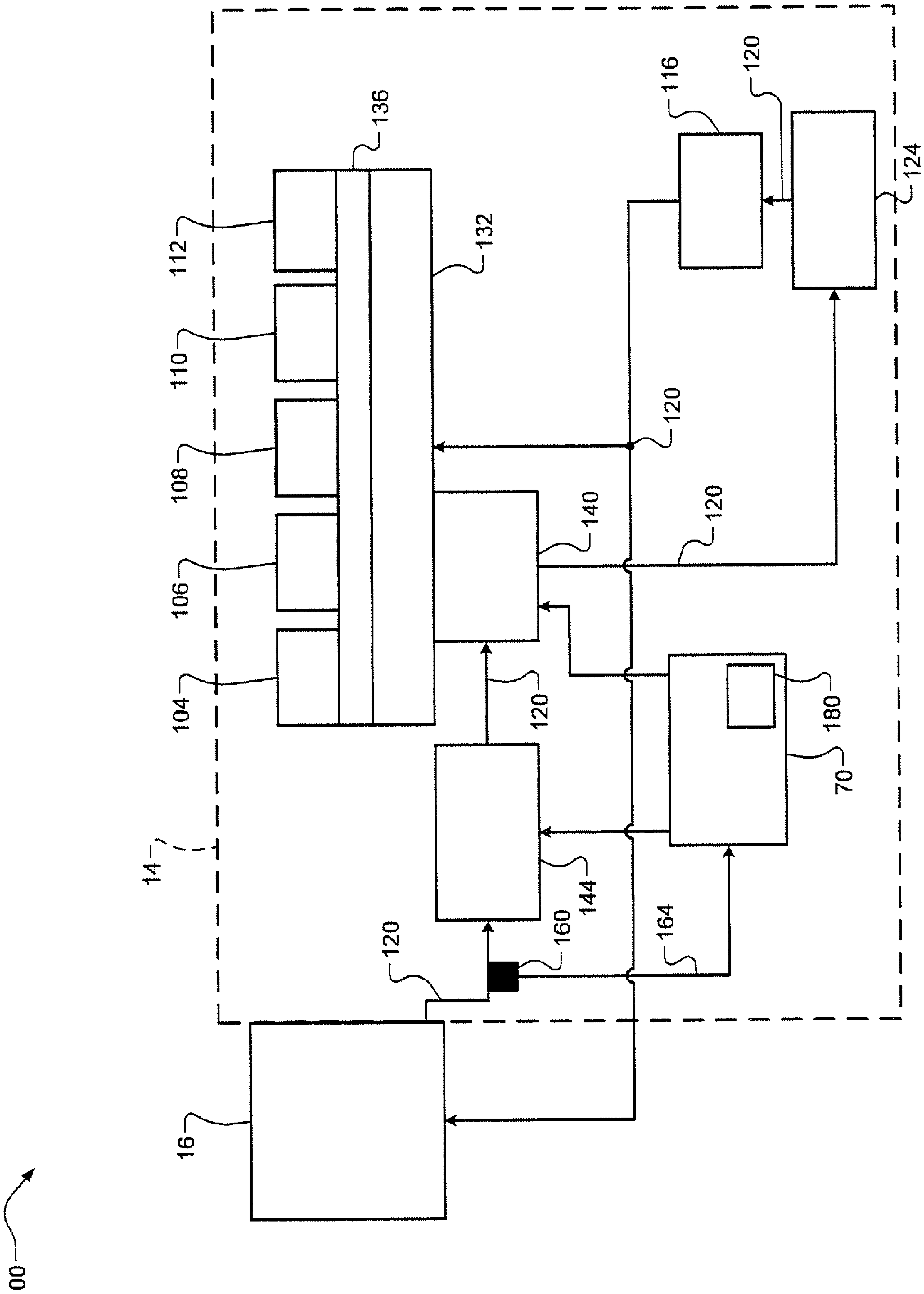

100
16
14
120
160
144
164
104
106
108
110
112
136
132
120
140
120
116
120
124
70
180

FIG. 2

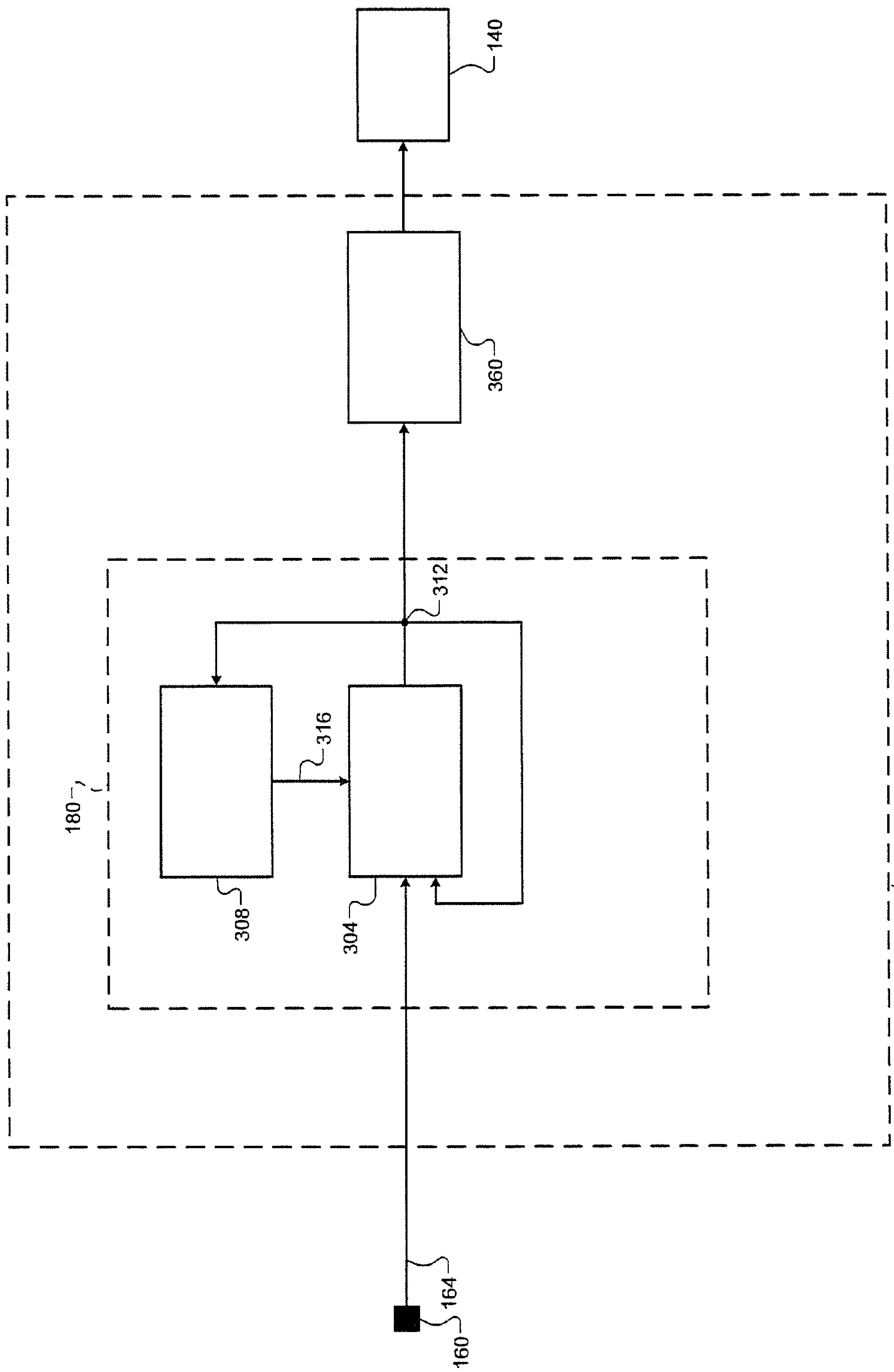


FIG. 3

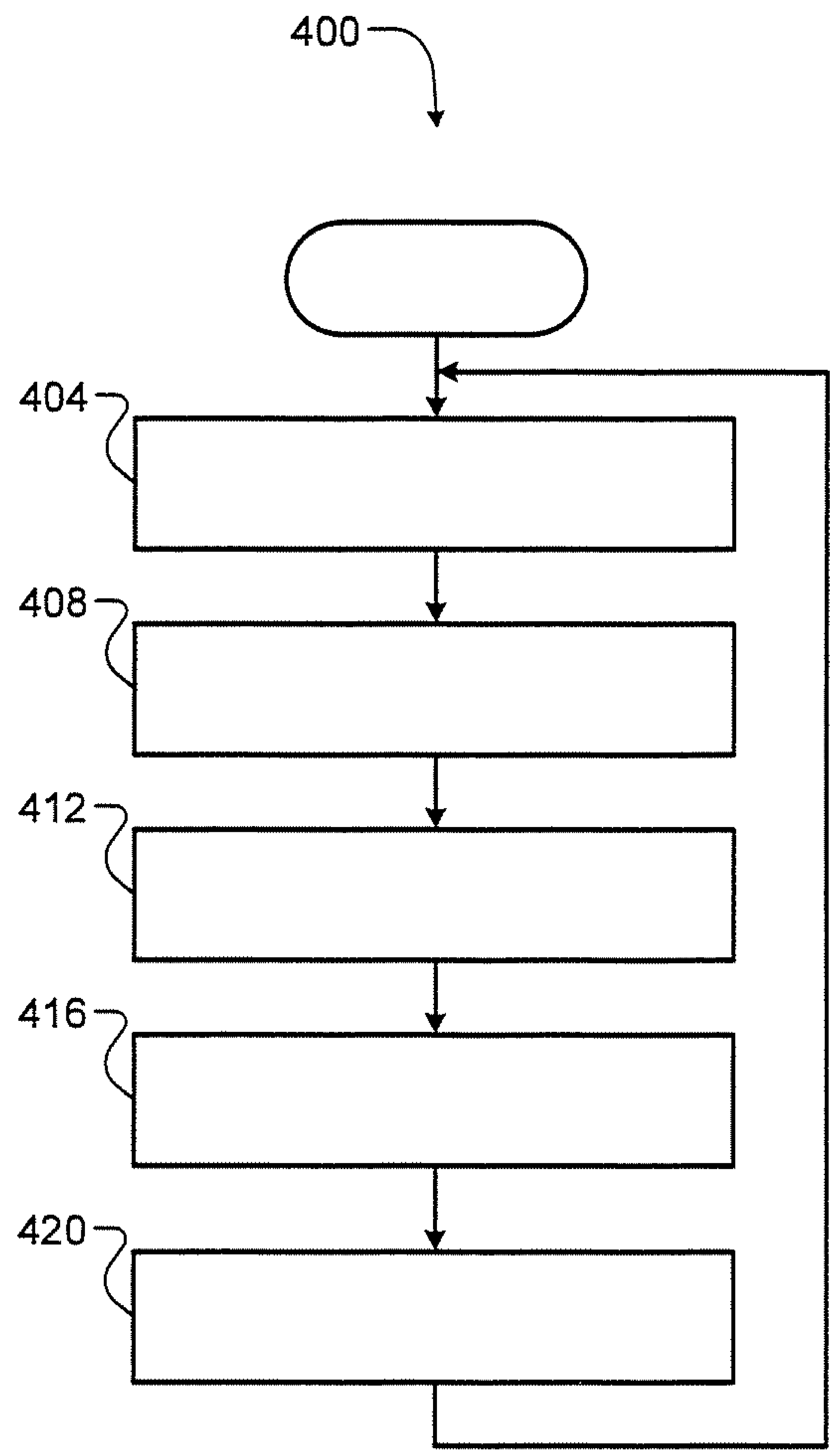


FIG. 4

TRANSMISSION OIL TEMPERATURE ESTIMATION SYSTEMS AND METHODS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 61/378,163, filed on Aug. 30, 2010. The disclosure of the above application is incorporated herein by reference in its entirety.

FIELD

The present disclosure relates to vehicle transmissions and more particularly to clutch-to-clutch transmissions.

BACKGROUND

The background description provided herein is for the purpose of generally presenting the context of the disclosure. Work of the presently named inventors, to the extent it is described in this background section, as well as aspects of the description that may not otherwise qualify as prior art at the time of filing, are neither expressly nor impliedly admitted as prior art against the present disclosure.

An engine generates torque, which is output to a transmission. An automatic transmission of a vehicle may include a plurality of fluid controlled friction devices, such as clutches. A control module may engage and disengage one or more of the clutches according to a predefined pattern to establish different gear ratios (also called speed ratios) within the transmission.

A gear ratio may be defined in terms of a ratio of a transmission input shaft speed divided by a transmission output shaft speed. A gear shift from one gear ratio to another gear ratio involves disengaging a first clutch that is associated with the current or actual gear ratio, and engaging a second clutch associated with a next gear ratio. The clutch to be disengaged during the gear shift is referred to as the offgoing clutch, and the clutch to be engaged during the gear shift is referred to as the oncoming clutch. Gear shifts of this type may be referred to as clutch-to-clutch shifts because no speed responsive or freewheeling elements are used.

SUMMARY

A system for a vehicle includes a filter module and a coefficient determination module. The filter module generates a valve body oil temperature signal as a function of a transmission oil temperature signal, the valve body oil temperature signal, and a filter coefficient. The coefficient determination module varies the filter coefficient based on the valve body oil temperature signal. The transmission oil temperature signal corresponds to a first temperature of transmission oil measured at a location between a torque converter and a variable bleed solenoid (VBS). The valve body oil temperature signal corresponds to a second temperature of transmission oil provided to a clutch of a transmission from a valve body.

A method for a vehicle includes generating a valve body oil temperature signal as a function of a transmission oil temperature signal, the valve body oil temperature signal, and a filter coefficient and varying the filter coefficient based on the valve body oil temperature signal. The transmission oil temperature signal corresponds to a first temperature of transmission oil measured at a location between a torque converter and a variable bleed solenoid (VBS). The valve body oil temperature signal corresponds to a second temperature of transmission oil provided to a clutch of a transmission from a valve body.

Another method for a vehicle includes: outputting a valve body oil temperature signal from a filter; inputting a previous value of the valve body oil temperature signal, a transmission oil temperature signal, and a filter coefficient to the filter; and varying the filter coefficient based on the valve body oil temperature signal. The transmission oil temperature signal corresponds to a first temperature of transmission oil measured at a location between a torque converter and a variable bleed solenoid (VBS). The valve body oil temperature signal corresponds to a second temperature of transmission oil provided to a clutch of a transmission from a valve body.

Further areas of applicability of the present disclosure will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples are intended for purposes of illustration only and are not intended to limit the scope of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

The present disclosure will become more fully understood from the detailed description and the accompanying drawings, wherein:

FIG. **1** is a functional block diagram of an example vehicle system according to the principles of the present disclosure;

FIG. **2** is a functional block diagram of an example transmission system according to the principles of the present disclosure;

FIG. **3** is a functional block diagram of an example valve body temperature estimation module according to the principles of the present disclosure; and

FIG. **4** is a flowchart depicting an example method of estimating a valve body transmission oil temperature according to the principles of the present disclosure.

DETAILED DESCRIPTION

The following description is merely illustrative in nature and is in no way intended to limit the disclosure, its application, or uses. For purposes of clarity, the same reference numbers will be used in the drawings to identify similar elements. As used herein, the phrase at least one of A, B, and C should be construed to mean a logical (A or B or C), using a non-exclusive logical or. It should be understood that steps within a method may be executed in different order without altering the principles of the present disclosure.

As used herein, the term module refers to, is part of, or includes an Application Specific Integrated Circuit (ASIC); an electronic circuit; a combinational logic circuit; a field programmable gate array (FPGA); a processor (shared, dedicated, or group) that executes code; other suitable components that provide the described functionality; or a combination of some or all of the above, such as in a system-on-chip. The term module may include memory (shared, dedicated, or group) that stores code executed by the processor.

The term code, as used above, may include software, firmware, and/or microcode, and may refer to programs, routines, functions, classes, and/or objects. The term shared, as used above, means that some or all code from multiple modules may be executed using a single (shared) processor. In addition, some or all code from multiple modules may be stored by a single (shared) memory. The term group, as used above, means that some or all code from a single module may be executed using a group of processors. In addition, some or all code from a single module may be stored using a group of memories.

The apparatuses and methods described herein may be implemented by one or more computer programs executed by one or more processors. The computer programs include processor-executable instructions that are stored on a non-transitory tangible computer readable medium. The computer programs may also include stored data. Non-limiting examples of the non-transitory tangible computer readable medium are nonvolatile memory, magnetic storage, and optical storage.

A pump pumps transmission oil from a transmission oil source (e.g., a sump) to a valve body and to a torque converter. The transmission oil flows between the valve body and one or more clutches of a transmission. One or more variable bleed solenoids (VBSs) regulate the flow of the transmission oil back to the source from the valve body and from the torque converter. A transmission oil temperature sensor measures temperature of the transmission oil at a location between the torque converter and the VBSs.

A control module (e.g., a transmission control module) controls the pressure of the transmission oil provided to the clutches (i.e., clutch pressures) of the transmission. The control module may control the clutch pressures based on the temperature measured using the transmission oil temperature sensor. However, when a vehicle is started, the temperature of the transmission oil within the source is generally less than the measured transmission oil temperature. The measured transmission oil temperature being greater than the temperature of the transmission oil within the source may be attributable to heat absorption within the torque converter.

The control module of the present disclosure estimates the temperature of the transmission oil output from the valve body. The control module applies a recursive, first-order lag filter (e.g., a Kalman filter) to the measured transmission oil temperature to estimate the temperature of the transmission oil output from the valve body. The control module controls the clutch pressures based on the estimated temperature of the transmission oil output from the valve body.

Referring now to FIG. **1**, a functional block diagram of an example vehicle system **10** is presented. An internal combustion engine **12** drives a transmission **14** via a torque converter **16**. The engine **12** may include, for example, a spark-combustion type engine, a compression-combustion type engine, and/or another suitable type of engine. A vehicle may also include one or more electric motors and/or motor generator units (MGUs) **18**.

The engine **12** outputs torque to the torque converter **16** via an engine output shaft **20**, such as a crankshaft. The torque converter **16** supplies torque to the transmission **14** via a transmission input shaft **22**. While the transmission **14** will be discussed as including a clutch-to-clutch type transmission, the transmission **14** may include another suitable type of transmission, such as a dual clutch transmission (DCT) or another type of automatic transmission.

The transmission **14** may include one or more gearsets (not shown) through which torque may be transferred between the transmission input shaft **22** and a transmission output shaft **24**. The transmission output shaft **24** drives a driveline **26** of the vehicle system **10**, and the driveline **26** transfers torque to wheels (not shown) of the vehicle.

A range selector **28** enables a user to select a mode of operation of the transmission **14** including, but not limited to, a park mode, a reverse mode, a neutral mode, or one or more forward drive modes. The transmission **14** may be capable of achieving a plurality of gear ratios. For example only, the transmission **14** may be capable of achieving six forward gear ratios, a reverse gear ratio, and a neutral gear ratio. The transmission **14** may be capable of achieving a greater or lesser number of forward gear ratios and/or a greater number of reverse gear ratios in various implementations. A gear ratio may be defined as the ratio between the rotational speed of the transmission input shaft **22** and the rotational speed of the transmission output shaft **24**.

An engine control module (ECM) **60** controls operation of the engine **12**. The ECM **60** or another control module (not shown) may control operation of the one or more MGUs **18** in various implementations. A transmission control module (TCM) **70** controls operation of the transmission **14**. While the TCM **70** is shown as being implemented within the transmission **14**, the TCM **70** may be implemented externally to the transmission **14** in various implementations. The ECM **60** and the TCM **70** may share data via a connection **72**.

Referring now to FIG. **2**, a functional block diagram of an example implementation of a transmission system **100** is presented. The transmission **14** includes a plurality of clutches, such as first, second, third, fourth, and fifth clutches **104**, **106**, **108**, **110**, and **112**, respectively. The transmission **14** may include a greater or fewer number of clutches. The first, second, third, fourth, and fifth clutches **104-112** will be collectively referred to hereafter as the clutches **104-112**.

The clutches **104-112** control which one of the gear sets is engaged within the transmission **14** at a given time. In other words, the clutches **104-112** control the gear ratio at a given time. Different gear ratios may be established when different combinations of one or more of the clutches **104-112** are engaged. An example table of clutch engagement combinations that may establish various gear ratios is provided below.

Gear	Clutches Engaged				
Ratio/Range	30	32	34	36	38
1	X				X
2	X			X	
3	X		X		
4	X	X			
5		X	X		
6		X		X	
R			X		X
N					X

For example only, a first forward gear ratio may be established when the first and fifth clutches **104** and **112** are engaged. A second forward gear ratio may be established when the first and fourth clutches **104** and **110** are engaged. A third forward gear ratio may be established when the first and third clutches **104** and **108** are engaged. A fourth forward gear ratio may be established when the first and second clutches **104** and **106** are engaged. A fifth forward gear ratio may be established when the second and third clutches **106** and **108** are engaged. A sixth forward gear ratio may be established when the second and fourth clutches **106** and **110** are engaged. The reverse gear ratio may be established when the third and fifth clutches **108** and **112** are engaged. The neutral gear ratio may be established when only the fifth clutch **112** is engaged. As the numerical title attributed to the forward gear ratios increases, the gear ratio (i.e., ratio of transmission input speed over transmission output speed) decreases. For example only, the gear ratio associated with the first forward gear ratio is greater than the gear ratio associated with the second gear ratio.

A gear shift between successive forward gear ratios is accomplished by disengaging a first one of the clutches **104-112** and engaging a second one of the clutches **104-112** while maintaining the engagement of a third one of the clutches **104-112**. The engagement and the disengagement of the first and second ones of the clutches **104-112** may be performed in concert.

For example only, a gear shift from the first forward gear ratio to the second forward gear ratio may be accomplished by disengaging the fifth clutch **112**, engaging the fourth clutch **110**, and maintaining the first clutch **104** as engaged. A gear shift from the second forward gear ratio to the third forward gear ratio may be accomplished by disengaging the fourth clutch **110**, engaging the third clutch **108**, and maintaining the first clutch **104** as engaged. A gear shift from the third forward gear ratio to the fourth forward gear ratio may be accomplished by disengaging the third clutch **108**, engaging the second clutch **106**, and maintaining the first clutch **104** as engaged. A gear shift from the fourth forward gear ratio to the fifth forward gear ratio may be accomplished by disengaging the first clutch **104**, engaging the third clutch **108**, and maintaining the second clutch **106** as engaged. A gear shift from the fifth forward gear ratio to the sixth forward gear ratio may be accomplished by disengaging the third clutch **108**, engaging the fourth clutch **110**, and maintaining the second clutch **106** as engaged.

Transmission oil **120** or another suitable fluid is directed to and from ones of the clutches **104-112** to control engagement and disengagement of the ones of the clutches **104-112**. A pump **116** draws the transmission oil **120** from a sump **124** or another suitable transmission oil source. The pump **116** pressurizes the transmission oil **120** and provides pressurized transmission oil to a valve body **132** and to the torque converter **16**. The valve body **132** includes one or more valves (not shown) that direct the transmission oil **120** to/from ones of the clutches **104-112** via passages (not shown) formed in a clutch plate **136**.

One or more variable bleed solenoids (VBSs) **140** are coupled to the valve body **132**. The VBSs **140** may allow some of the transmission oil **120** bleed from the valve body **132** (at a relatively higher pressure) back to the sump **124** (at a relatively lower pressure). In this manner, the VBSs **140** control the flow of the transmission oil **120** from the valve body **132** back to the sump **124**. The TCM **70** controls the VBSs **140**. The TCM **70** may control the VBSs **140**, for example, to regulate pressure within the valve body **132** and to control the flow of the transmission oil **120** to/from one or more of the clutches **104-112**.

As stated above, the pump **116** also provides the transmission oil **120** to the torque converter **16**. More specifically, the pump **116** may provide the transmission oil **120** to a clutch (not shown) of the torque converter **16**. Opening of a feed valve **144** controls the flow of the transmission oil **120** from the torque converter **16** to the VBSs **140**. The TCM **70** may control the feed valve **144**. The VBSs **140** may also allow some of the transmission oil **120** to bleed from the torque converter **16** (at a relatively higher pressure) back to the sump **124** (at a relatively lower pressure). For a period after a vehicle startup, the temperature of the transmission oil **120** flowing from the torque converter **16** to the VBSs **140** is generally greater than the temperature of the transmission oil **120** within the sump **124**. Accordingly, the transmission oil **120** flowing from the torque converter **16** to the VBSs **140** is also generally warmer than the transmission oil **120** flowing from the valve body **132**.

The TCM **70** controls the pressure of the transmission oil **120** provided to each of the clutches **104-112** to control the gear ratio engaged within the transmission **14** and to control shifts between two gear ratios (i.e., gear shifts). The TCM **70** controls the pressure of the transmission oil **120** provided to each of the clutches **104-112** via the VBSs **140**. The TCM **70** controls the clutch pressures based on one or more measured temperatures.

A transmission oil temperature sensor **160** measures the temperature of the transmission oil **120** between the torque converter **16** and the VBSs **140**. For example only, the transmission oil temperature sensor **160** may measure the temperature of the transmission oil **120** at a location between the torque converter **16** and the feed valve **144** or at a location between the feed valve **144** and the VBSs **140**. The transmission oil temperature sensor **160** generates a transmission oil temperature signal **164** based on the temperature of the transmission oil **120**.

The TCM **70** includes an oil temperature estimation module **180** (see also FIG. **3**). The oil temperature estimation module **180** estimates the temperature of the transmission oil **120** output from the valve body **132**. The temperature of the oil output from the valve body **132** will hereafter be referred to as the valve body oil temperature. The oil temperature estimation module **180** estimates the valve body oil temperature based on the transmission oil temperature measured using the transmission oil temperature sensor **160**.

Referring now to FIG. **3**, a functional block diagram of an example implementation of the oil temperature estimation module **180** is presented. The oil temperature estimation module **180** includes a filter module **304** and a coefficient determination module **308**.

The filter module **304** receives the transmission oil temperature signal **164** from the transmission oil temperature sensor **160**. The filter module **304** generates a valve body oil temperature signal **312** that corresponds to the valve body oil temperature. The filter module **304** generates the valve body oil temperature signal **312** based on the transmission oil temperature signal **164**, the value of the valve body oil temperature signal **312** from the last control loop, and a filter coefficient **316**. The filter module **304** generates the valve body oil temperature signal **312** using a recursive, first-order lag filter. The recursive, first-order lag filter may include a Kalman filter. In various implementations, the filter module **304** may use a value of the valve body oil temperature signal **312** from a previous control loop other than the last control loop.

For example only, the filter module **304** may generate the valve body oil temperature signal **312** using the equation:

$$VBOT=LastVBOT+(LastVBOT-TransOT)*FC,$$

where VBOT is the valve body oil temperature signal **312** for the present control loop, LastVBOT is the value of the valve body oil temperature signal **312** from the last control loop, and FC is the filter coefficient **316**. The filter module **304** may perform control loops at a predetermined loop rate, such as one control loop per 12.5 milliseconds (ms) or at another suitable loop rate. A buffer (not shown), for example, may be implemented that stores the present value of the valve body oil temperature signal **312** and the last value of the valve body oil temperature signal **312**. The present and last values of the valve body oil temperature signal **312** may be updated once per control loop.

The coefficient determination module **308** determines the filter coefficient **316** for the present control loop based on the valve body oil temperature signal **312** from the last control loop. For example only, the coefficient determination module **308** may determine the filter coefficient **316** using one of a mapping and a function that relates the filter coefficient **316** to the value of the valve body oil temperature signal **312** from the last control loop. The coefficient determination module **308** increases the filter coefficient **316** as the value of the valve body oil temperature signal **312** increases and vice versa. In this manner, at higher values of the valve body temperature, the magnitude of possible changes in the valve body oil temperature signal **312** increases, and vice versa. The filter coefficient **316** increases, and therefore less filtering is performed by the filter module **304**, as the valve body oil temperature signal **312** approaches the transmission oil temperature signal **164** after a vehicle startup.

The TCM **70** may also include a clutch pressure control module **360**. The clutch pressure control module **360** controls one or more clutch pressures based on the valve body oil temperature signal **312**. For example only, the clutch pressure control module **360** may control one or more clutch pressures as a function of the valve body oil temperature signal **312**.

Referring now to FIG. **4**, a flowchart depicting an example method **400** of generating the valve body oil temperature signal **312** is presented. Control begins with **404** where control receives the transmission oil temperature signal **164**. Control proceeds with **408** where control determines the filter coefficient **316**. Control determines the filter coefficient **316** based on the value of the valve body oil temperature signal **312** from the last control loop.

At **412**, control generates the valve body oil temperature signal **312**. Control generates the valve body oil temperature signal **312** based on the value of the valve body oil temperature signal **312** from the last control loop, the transmission oil temperature signal **164**, and the filter coefficient **316**. Control generates the valve body oil temperature signal **312** using a recursive, first-order lag filter. Control may generate the valve body oil temperature signal **312** using the equation described above. Control sets the last value of the valve body oil temperature signal equal to the valve body oil temperature signal **312** at **416**. In this manner, control updates the last value of the valve body oil temperature signal **312** for use during the next control loop at **416**. Control controls one or more clutch pressures based on the valve body oil temperature signal **312** at **420**, and control returns to **404**.

The broad teachings of the disclosure can be implemented in a variety of forms. Therefore, while this disclosure includes particular examples, the true scope of the disclosure should not be so limited since other modifications will become apparent to the skilled practitioner upon a study of the drawings, the specification, and the following claims.

What is claimed is:

1. A system for a vehicle, comprising:

a first electronic circuit that generates a valve body oil temperature signal as a function of a transmission oil temperature signal, a previous value of the valve body oil temperature signal, and a filter coefficient,

wherein the transmission oil temperature signal corresponds to a first temperature of transmission oil measured at a location between a torque converter and a variable bleed solenoid (VBS), and

wherein the valve body oil temperature signal corresponds to a second temperature of transmission oil provided to a clutch of a transmission from a valve body; and

a second electronic circuit that varies the filter coefficient based on the valve body oil temperature signal.

2. The system of claim **1** wherein the second electronic circuit increases the filter coefficient when the valve body oil temperature signal increases.

3. The system of claim **1** wherein the second electronic circuit decreases the filter coefficient when the valve body oil temperature decreases.

4. The system of claim **1** wherein the second electronic circuit generates the filter coefficient using one of a function and a mapping that relates the valve body oil temperature signal to the filter coefficient.

5. The system of claim **1** wherein the first electronic circuit sets the valve body oil temperature signal equal to a sum of the valve body oil temperature signal and a product of the filter coefficient and a difference between the valve body oil temperature signal and the transmission oil temperature signal.

6. The system of claim **1** wherein the first electronic circuit generates the valve body oil temperature signal using a Kalman filter.

7. The system of claim **1** further comprising a third electronic circuit that controls a pressure of the transmission oil provided to the clutch based on the valve body oil temperature signal.

8. A method for a vehicle, comprising:

generating, using a filter module, a valve body oil temperature signal as a function of a transmission oil temperature signal, a previous value of the valve body oil temperature signal, and a filter coefficient,

wherein the transmission oil temperature signal corresponds to a first temperature of transmission oil measured at a location between a torque converter and a variable bleed solenoid (VBS), and

wherein the valve body oil temperature signal corresponds to a second temperature of transmission oil provided to a clutch of a transmission from a valve body; and

varying, using a coefficient determination module, the filter coefficient based on the valve body oil temperature signal.

9. The method of claim **8** further comprising increasing the filter coefficient when the valve body oil temperature signal increases.

10. The method of claim **8** further comprising decreasing the filter coefficient when the valve body oil temperature decreases.

11. The method of claim **8** further comprising generating the filter coefficient using one of a function and a mapping that relates the valve body oil temperature signal to the filter coefficient.

12. The method of claim **8** further comprising setting the valve body oil temperature signal equal to a sum of the valve body oil temperature signal and a product of the filter coefficient and a difference between the valve body oil temperature signal and the transmission oil temperature signal.

13. The method of claim **8** further comprising generating the valve body oil temperature signal using a Kalman filter.

14. The method of claim **8** further comprising controlling a pressure of the transmission oil provided to the clutch based on the valve body oil temperature signal.

15. A method for a vehicle, comprising:

ouputting, from a filter module, a valve body oil temperature signal;

inputting, to the filter module, a previous value of the valve body oil temperature signal, a transmission oil temperature signal, and a filter coefficient,

wherein the transmission oil temperature signal corresponds to a first temperature of transmission oil measured at a location between a torque converter and a variable bleed solenoid (VBS), and

wherein the valve body oil temperature signal corresponds to a second temperature of transmission oil provided to a clutch of a transmission from a valve body; and

varying, using a coefficient determination module, the filter coefficient based on the valve body oil temperature signal.

16. The system of claim **1** wherein the first and second electronic circuits include at least one of an Application Specific Integrated Circuit (ASIC), a processor, a combinational logic circuit, and a field programmable gate array (FPGA).

* * * * *